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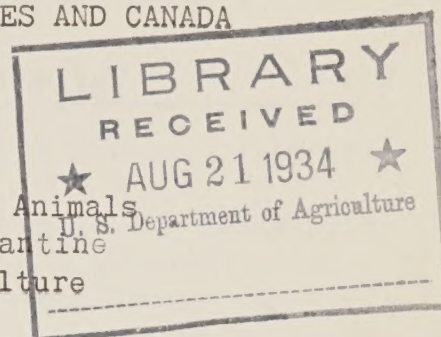
A SURVEY OF THE USE OF STERILE MAGGOTS IN THE TREATMENT OF
SUPPURATIVE INFECTIONS IN THE UNITED STATES AND CANADA

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The Baer method of treating osteomyelitis and other infected wounds with live blowfly maggots has now been in use more than five years. During this time the method has been given a widespread trial in the United States and in several other countries, and has been used in the treatment of numerous purulent conditions.

In an investigation of the effectiveness of blowfly maggots for this purpose, 947 copies of a questionnaire were sent out from the Bureau of Entomology to all surgeons in the United States and Canada known to have used the maggot treatment. The following were some of the questions asked:

1. For what diseases have you used the maggot treatment?
2. What is your opinion of this method of treatment?
3. Do you have any specific objection to this method?
4. How many cases have you treated in this way?
5. From what source did you obtain your supply of maggots?

About 64 percent of the questionnaires were answered, and through the courtesy of those who thus cooperated in the investigation a considerable amount of information upon this subject has been obtained. As there has been a marked scarcity of comment, favorable or otherwise, published upon the use of the maggot treatment, a summary of the data secured is presented herewith.

EXTENT OF THE USE OF THIS METHOD AND THE NUMBER OF CASES TREATED

In the United States the therapeutic use of maggots was reported by 585 surgeons, as shown in Table I, and the treatment has been given in every State. The total number of cases treated in this way was 5,684. In Canada 20 surgeons reported using the method upon 66 cases.

The method has also been used in Mexico, Brazil, Peru, Chile, England, France, Germany, Switzerland, Spain, Morocco, the Sudan, and Australia.

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Table I

Number of Surgeons Using the Method and Cases Treated
in the United States and Canada

State	Surgeons	Cases	State	Surgeons	Cases
Alabama	4	36	Indiana	20	190
Arizona	2	2	Iowa	13	28
Arkansas	2	3	Kansas	12	75
California	25	158	Kentucky	7	36
Colorado	16	127	Louisiana	4	43
Connecticut	12	139	Maine	11	112
Delaware	1	1	Maryland	9	302
Florida	14	176	Massachusetts	10	83
Georgia	10	37	Michigan	22	378
Illinois	50	614	Minnesota	11	190
Mississippi	4	21	Pennsylvania	61	736
Missouri	10	76	Rhode Island	2	6
Montana	2	2	South Carolina	4	11
Nebraska	7	50	South Dakota	2	4
Nevada	1	1	Tennessee	23	131
New Hampshire	2	4	Utah	4	24
New Jersey	20	281	Vermont	1	1
New Mexico	3	11	Virginia	7	66
New York	90	715	Washington	8	61
North Carolina	2	4	West Virginia	10	283
North Dakota	4	7	Wisconsin	22	64
Ohio	25	301	Wyoming	2	3
Oklahoma	2	7	District of Columbia	3	56
Oregon	9	28	Canada	20	66
			Total	605	5,750

INFECTED CONDITIONS FOR WHICH MAGGOTS WERE USED

A list is given in Table II of the various diseased conditions which have been treated with maggots. They are all of a purulent nature, the presence of pus or other necrotic tissue in the wound being essential for the activity of maggots, which will not normally feed upon living tissue. Maggots have not been found generally satisfactory for use in tuberculous bone lesions unless complicated with osteomyelitis. They have been used with some success for the removal of superficial, sloughing cancerous areas, but not before necrosis occurs.

Table II

Suppurative Infections Treated with Maggots

Abscesses, chronic tubercular	Grafts (infected), bone muscle skin
Burns, with infected necrotic areas	Mastoiditis
Carbuncles	Osteomyelitis, acute chronic - all bones tubercular
Cellulitis	Periostitis
Decubitus, sloughing	
Empyema, chronic	Ulcers, chronic syphilitic varicose
Felons	
Gangrene, arteriosclerotic diabetic gas	Wounds, infected sloughing malignant

OPINION OF SURGEONS UPON THE VALUE OF THE MAGGOT TREATMENT

In the questionnaire a request was made for an expression of opinion as to the merits of the maggot treatment. This was freely complied with, and the results are summarized in Table III. An unfavorable opinion was received from 4.4 percent; a reserved or a neutral opinion from an equal number; and a favorable opinion was expressed by 91.2 percent of the users of the method.

Table III

Summary of Opinion Expressed Upon the Method

	No. of Surgeons	
Unsatisfactory	8	
Not impressed	3	
Unfavorable	3	
Does not advise it	1	
Troublesome	2	
Ineffective	5	
Doubtful benefit	1	
No better than other methods	2	
Superfluous	1	
Useless	1	
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Total	27	---- 198 cases
Neutral	3	
Reserved	23	
Total	26	---- 71 cases
Good	97	
Very good	96	
Excellent	106	
Satisfactory	25	
Very satisfactory	32	
Very effective	53	
Unequaled	22	
Definite advance	10	
Very successful	17	
Valuable	29	
Startling	8	
Very gratifying	12	
Best of all	13	
Nothing but praise	4	
Very encouraging	18	
Saved amputation	1	
Fair	2	
Well pleased	7	
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Total	552	---- 5,481 cases

Additional comments were sometimes made, of which the following are typical:

"The maggot treatment is the most rapid and excellent method I have ever used."

"Healing was obtained in chronic cases when other methods had failed."

"Hospitalization is shortened by the rapid cleaning up of the detritus."

"The treatment prolongs the healing period."

"The maggots are more selective than my surgery."

"The treatment results in rapid healing and minimum scar formation."

Occasionally there were cases to which the maggot treatment was not adaptable. This was partly because the location of the wound was such that the maggots could not be retained or that the excessive secretions could not be drained off. Another factor was the mental attitude of patients. The nature of the treatment is at first repellent to some people who object to the use of maggots. One comment was that the method can be used better in patients of a low psychological type who will not be disturbed by the presence of the maggots; and another opinion was that patients of higher intelligence and morale are more satisfactory. In general, cooperation from patients was good when the method of treatment was understood.

In two series of treatments, each comprising "20 to 25" cases, in which the same species of sterile maggots was used and for the same disease, namely osteomyelitis, the results obtained differ so widely as to make them of special interest. Each series was long enough, also, to permit a fairly definite opinion to be formed. In the one questionnaire it was stated that beneficial results had been obtained, while in the other it was said that the method was useless. This possibly illustrates the importance of the personal element in the maggot treatment as in other methods. In another questionnaire this matter was touched upon in the following remark: "Any condemnation of this method I feel is due to poor handling."

OBJECTIONS TO THE MAGGOT TREATMENT

In reply to the question "Do you have any specific objection to this method?" the answer "No" was given in most instances. The objections which were given fall into three classes: (1) Expense in obtaining maggots; (2) pain and discomfort to patients; (3) time and trouble in applying the treatment.

Many of the users of this method do not rear their own supply of maggots and have to depend upon obtaining them from a medical supply

house. In addition, some of the cases treated are charity patients, and the cost of the maggots is then said to be "prohibitive." In this connection it might be stated that with proper equipment and training private rearing of maggots is now quite feasible. Unless a very small and irregular supply is needed, private production is usually much less expensive and more convenient. The work can be done in a small space in the ordinary hospital laboratory, and a technician can usually learn the method in a short time. In multigraphed circular E-311, issued by the Bureau of Entomology, detailed descriptions are given of a satisfactory cultural method.

Where two or more surgeons in the same vicinity are using the maggot treatment, club rearing of maggots provides a ready source of supply and at reduced costs. This is already being done in several places, and shipments have been made outside the city and into the adjoining State.

Pain and discomfort experienced in some cases are occasionally severe, especially in the early stages of the treatment and with nervous patients. In such cases, however, if the first two or three implantations of maggots can be tolerated, probably with the use of sedatives, the remaining implantations usually become less painful. Overcrowding the wound with small and rapidly growing maggots tends to increase the severity of the discomfort.

The maggot treatment has been found by some to be troublesome and time-consuming. Within the last two years, however, various improvements in methods of applying the treatment have been devised which make the technic of application more simple. A classified list of articles published in the medical and biological literature upon the use of maggots in wounds has been issued by the Bureau of Entomology in multigraphed circular E-310, and a copy of it will be mailed upon request.

SUMMARY

A survey has been made of the use of sterile maggots in the treatment of infected wounds of humans. The treatment has been given in every State in the United States and in Canada, and 605 surgeons have used the method upon 5,750 cases. It has also spread to many other countries. A list is given of the various infections which have been treated with maggots. The opinions of the surgeons using this method were obtained and are shown in tabular form: 4.4 percent of the opinion was unfavorable, 4.4 percent reserved or neutral, and 91.2 percent favorable to the maggot treatment. The objections to the method which were made are stated and discussed.